DOMINO
Version 2.5.0
additional service manual for new features

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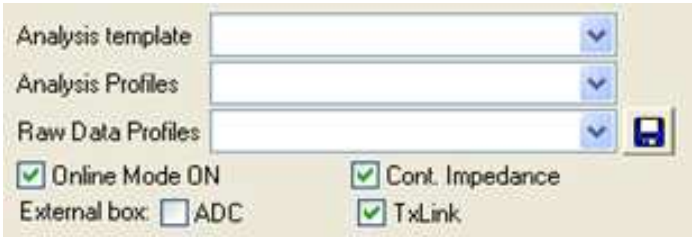
1. Selection of TxLink and ADC board for montages

For the use of TxLink and the ADC board it is possible to save these external boxes for individual montages. Choose the desired montage inside the Montage Editor and activate the checkbox for the corresponding external box that is supposed to be recorded.

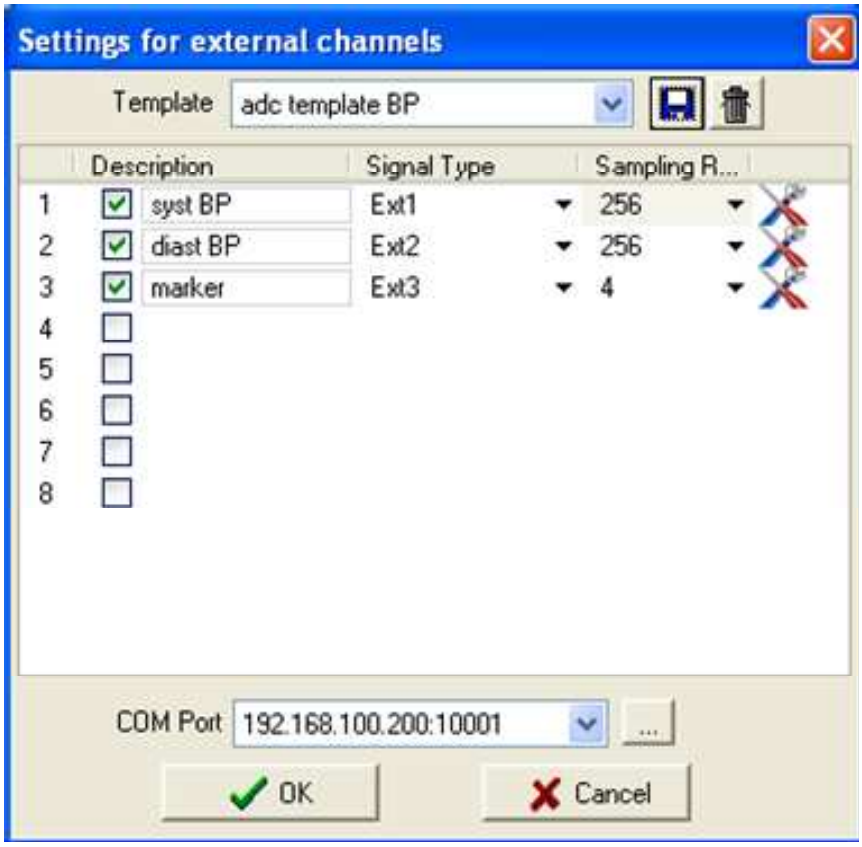


While preparing an Online recording the selected external box is automatically activated for the corresponding montage. Additionally the last used settings of IP address and selected channels for the external box are provided.

2. Calibration of external ADC board channels

For ease of use of the ADC board, the calibration of the external channels recorded by the ADC board can take place during the preparation of online recordings. After selection of the corresponding montage with ADC board connection press button “Settings” to open the window for the settings of the external channels.

Here you can define the number of external channels to be recorded, the corresponding channel description, the signal type and the sampling rate.



For entering the IP of the external device tick the ... icon. By ticking the tool icon the frame for channel calibration will be opened. Here the calibration of the external channels can take place. Confirm your calibration by using the Ok button.

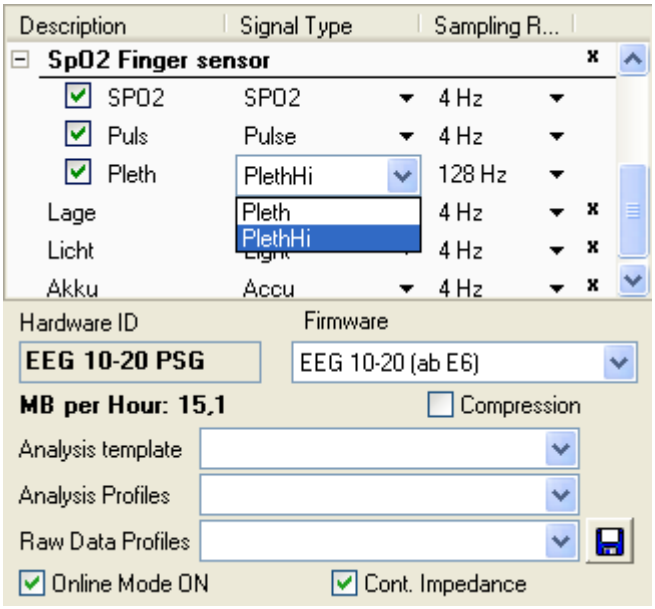
In order to save all parameters defined inside the channel settings as well as the calibration of the selected channels press the disc icon . You will now be requested to enter a template name. Confirm the template with “OK”. All created templates are available in the drop down menu in the upper bar of the frame “Settings for external channels” and can be selected for recording. Existing templates can be deleted by using the trash can icon .

With the use of different templates different configurations of external channels and devices can be saved, which makes the use of the ADC board very user friendly.

3. 16 Bit resolution for Pleth-Signal

Alternatively to the conventional pleth signal with 8 Bit resolution, the pleth signal can be recorded with 16 Bit resolution. Recording of a 16 Bit pleth signal provides an enlarged measuring range and avoids poor pleth signals due to weak or high blood circulation.

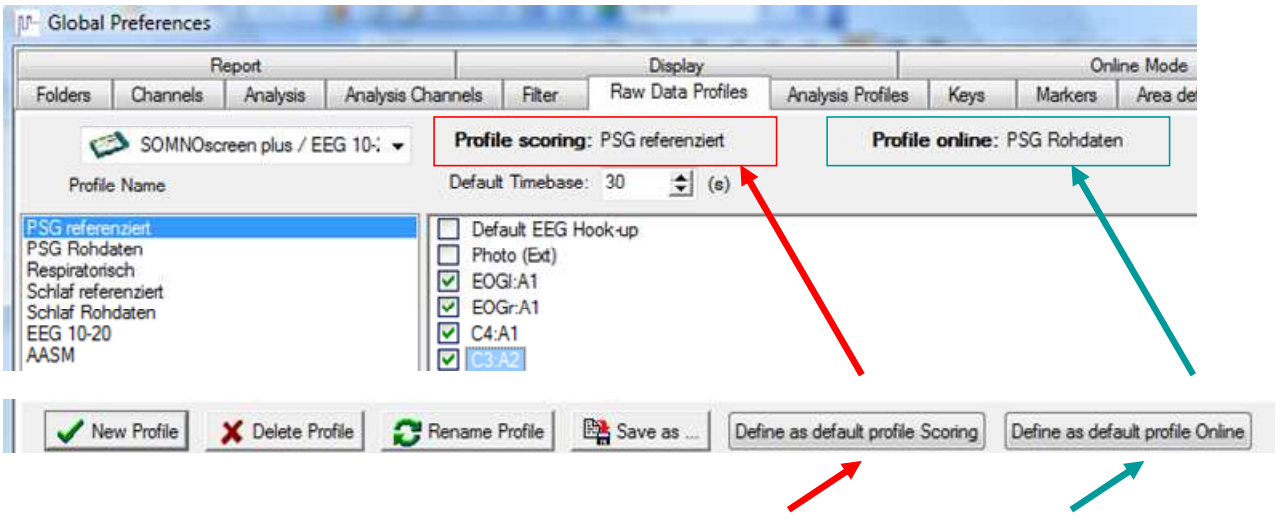
For recording pleth signal with 16 Bit resolution choose PlethHi as signal type for the corresponding montage inside the montage editor and confirm the montage by ticking the save button.



Notice: For recording of 16 Bit pleth signal, the latest firmware E07 and brazing of a new resistance within the hardware is required for devices with a SN before SSP2573. If you like to use the 16 Bit recording of pleth signal, please contact our Service support to arrange the required firm- and hardware updates.

4. Providing separated raw- and analysis data profiles

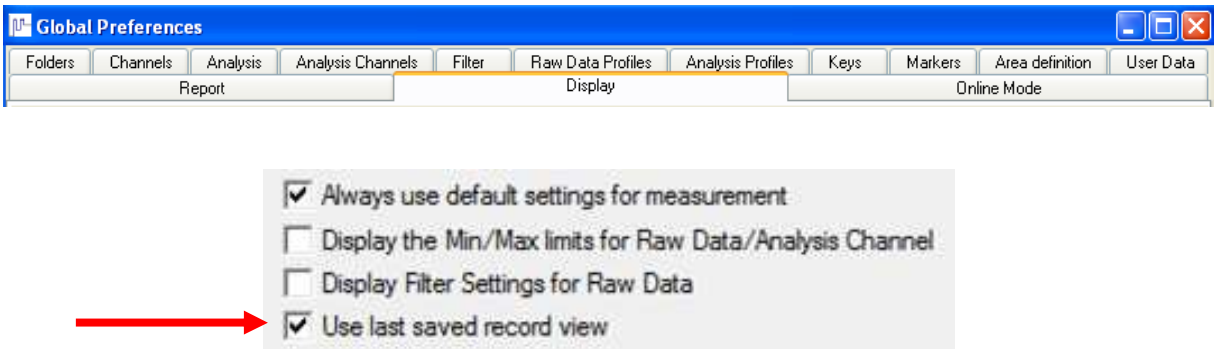
In the case that separated profiles of analysis data and raw data are required for recording and scoring, data profiles can be defined as default profiles both for scoring and recording. Select your desired profile within the tabs Raw Data Profiles and Analysis Profiles of the global preferences and tick button “Define as default profile Scoring” to define the selected profile as default profile for scoring. For defining a chosen profile as default profile for recording tick button “Define default profile Online”.



The data profiles defined as default profiles for scoring or online recording are indicated in the upper display of tabs Raw Data Profiles and Analysis Profiles (indicated with a red and blue box in the picture).

5. Retaining the last display settings

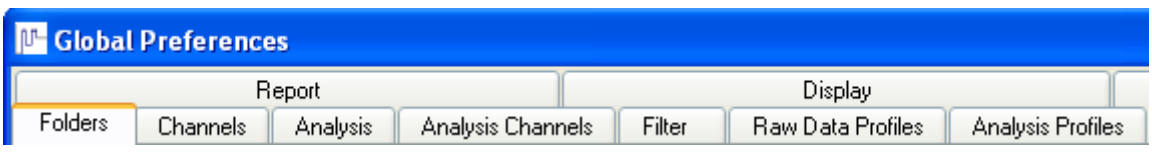
After closing, recordings are usually re-opened in the standard view. Additionally, it is possible to re-open recordings with the last chosen settings (selected channels, channel settings, tool bar). To open recordings with the last chosen display settings, activate checkbox “Use last saved record view” within tab “Display” of the global preferences.

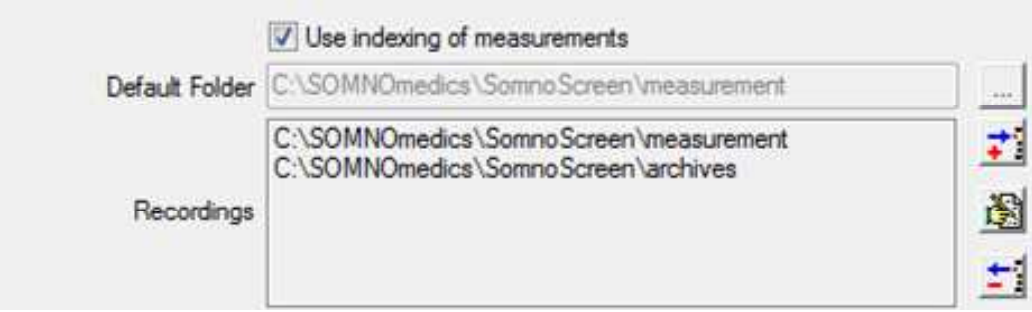


6. Accelerated opening of files in the opening dialogue

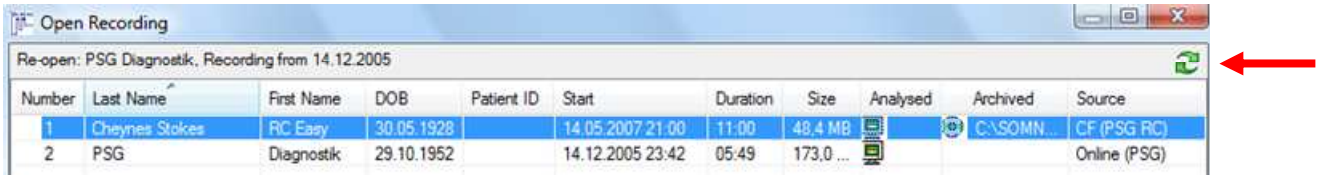
In order to accelerate the opening of record folders in the opening dialogue the so called “indexing of measurements” can be used. When using this function, an additional SomnoSearch.ini file will be generated for every folder that is added to the folder list. The SomnoSearch.ini file contains all parameters that are displayed in the opening dialogue like patient name, patient ID, date of birth and so on. During opening of the corresponding record folder the parameters saved in the SomnoSearch.ini file will be read at a first step resulting in an accelerated way of opening folders in the opening dialogue.

To make use of the indexing function activate checkbox “Use indexing of measurements” in tab “Folders” of the global preferences.





Use of the indexing function is indicated with the indexing icon in the upper right corner of the opening dialogue.

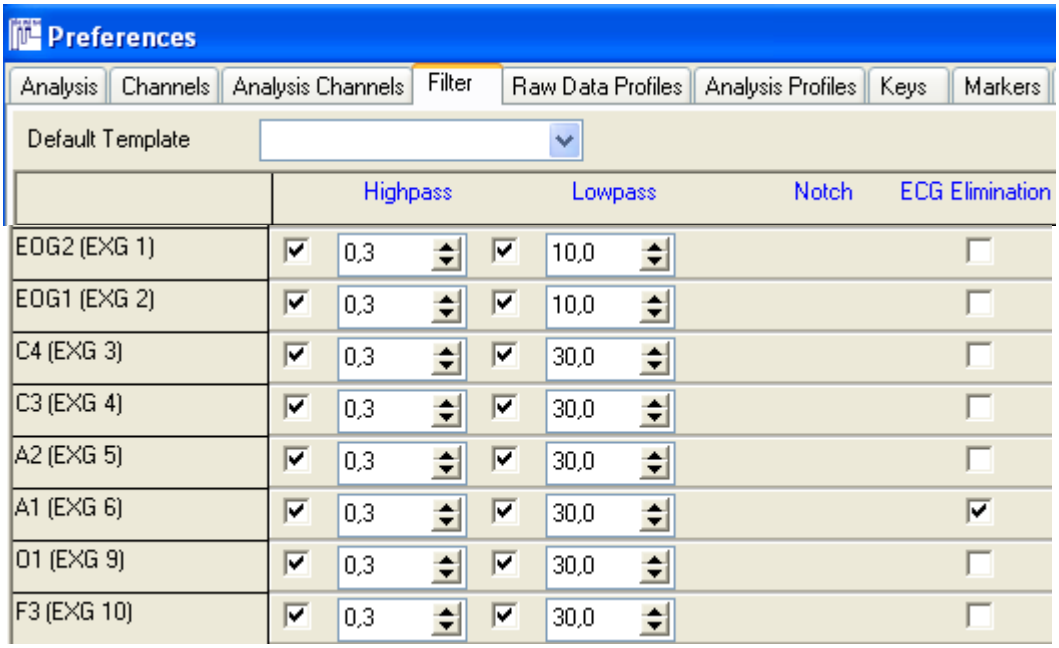


Note: the indexing function is only available for folders that are included in the folder list (button “Add folder to list” in the opening dialogue). Recordings that are copied manually without using the copy or move to… function of the software won’t be automatically displayed in the opening dialogue for use of the indexing function. Here a refreshing of the opening dialogue is required which can be carried out by simply ticking the indexing icon .

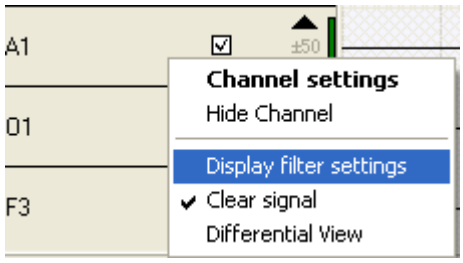
7. Automatic elimination of ECG signals in EEG channels

In the case that leads for EEG recordings are poorly applied, ECG signals are present within the EEG and therefore hamper automatic or manual analysis of the EEG signal. In order to remove these undesired ECG signals, an automatic elimination via wavelet transformation is available. There are three different ways to activate the wavelet ECG elimination:

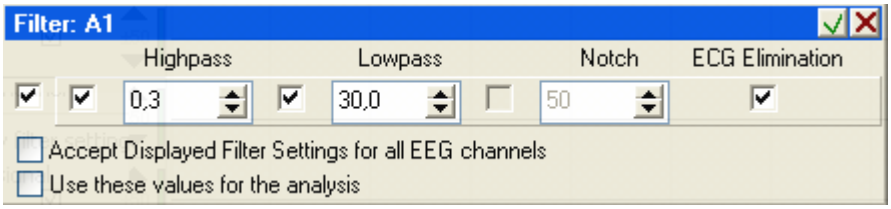
1. Open the local preferences of the recording by choosing “Preferences” inside the main menu point “Tools”. Then choose tab “Filter”. Here checkboxes are available for every recorded EEG channel. After activation of the corresponding checkboxes and confirmation with “OK” the EEG signals will be re-calculated resulting in ECG-free signals.



2. Right click onto the channel description to open the channel menu and choose “Display filter settings”.



The menu for the display filter settings will be opened. Activate checkbox ECG elimination and confirm by ticking the green check mark in the upper right corner.



3. Open the raw data menu by right click onto the raw data frame and select menu point “Change reference source”. Inside tab “ECG Elimination” all recorded EEG channels are available and can be selected for ECG elimination.

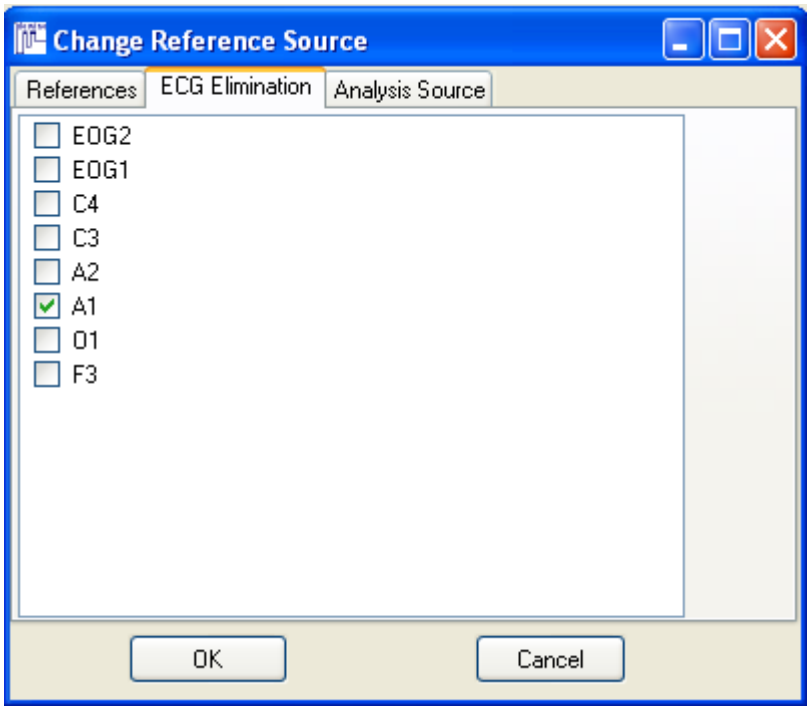
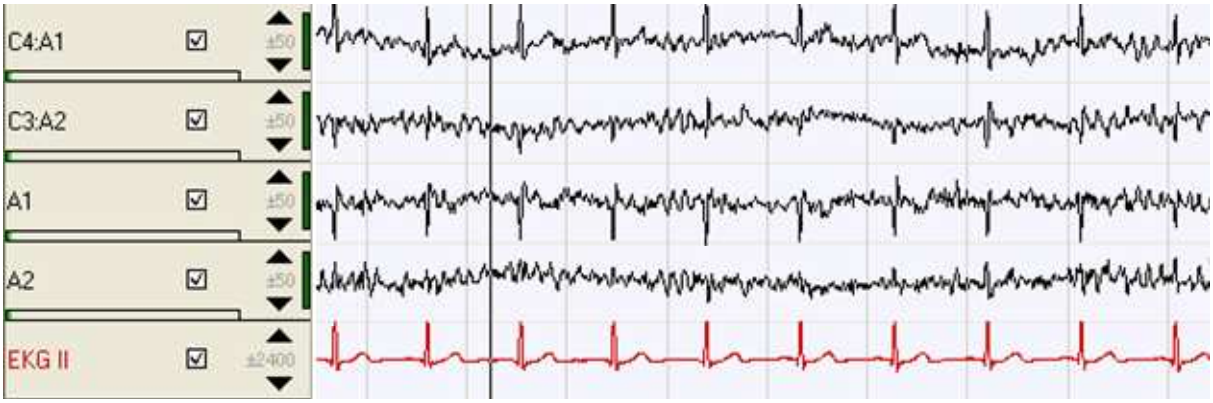
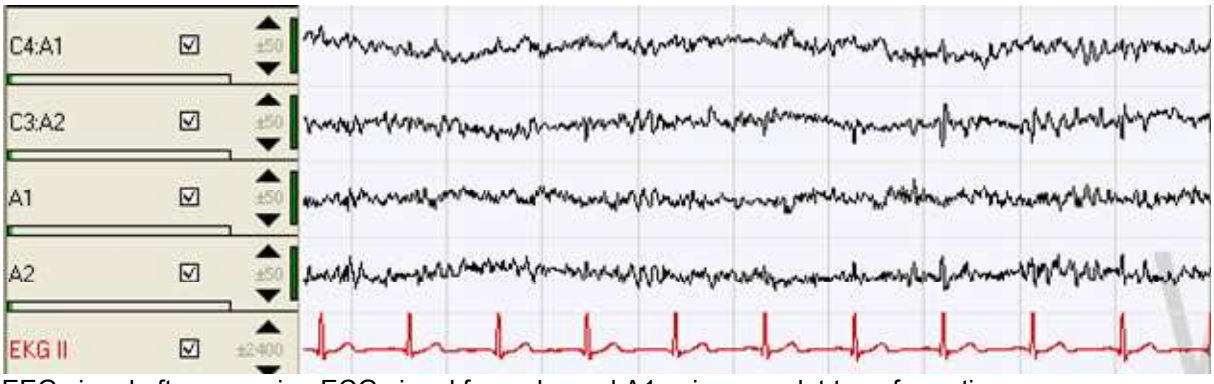


Illustration of EEG signals before and after use of the ECG wavelet transformation:



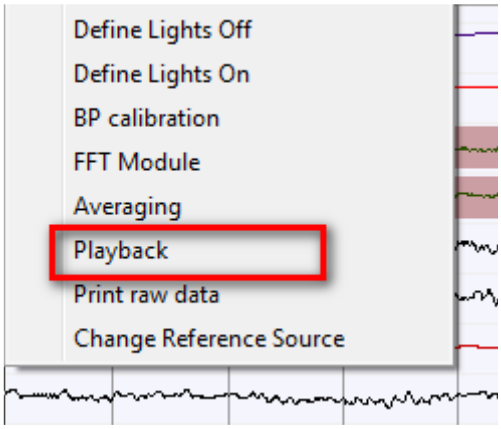
EEG signal before wavelet ECG elimination.



EEG signal after removing ECG signal from channel A1 using wavelet transformation.

8. Acoustic replay of EEG signals

In order to make the detection of special EEG patterns like spike bursts easier, the software provides the possibility of an acoustic replay and analysis of signals. The acoustic replay is available with function “Playback” of the raw data`s pop up menu.



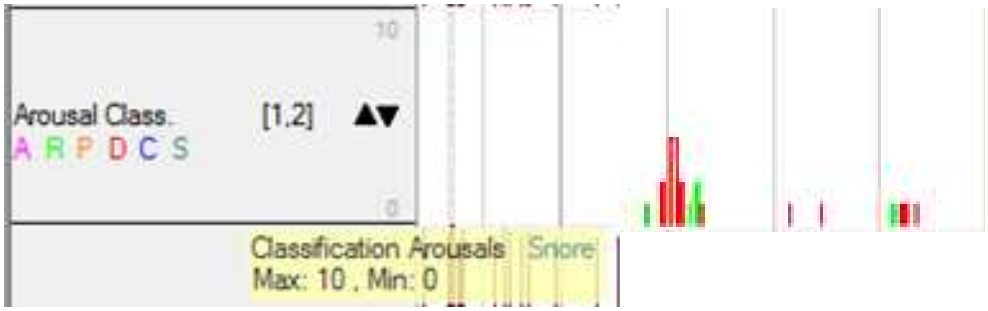
The window „Playback“ opens where the rawdata can be displayed with a defined velocity. In the drop down menus “Source” and “Speed” the requested channel as well the desired speed for replay can be selected. For an acoustic replay, push the loud speaker button . Acitivated acoustic replay will be indicated by an activated loud speaker . Note, that the replay velocity needs to be at least 5x for acoustic replay of EEG signals with a sampling frequency of 128 Hz. In General, the product of the signal’s sampling rate multiplied with the set velocity should be at least 512 Hz.
With the scroll bar on the right side of the frame, the sound volume can be tuned. After pressing the “Play” button the reply starts.

In order to have an repeated replay of interesting areas the loop button can be used. Tu use this function, mark areas inside the raw dat with your mouse cursor and tick the loop button.

9. Colour coding for classified arousals

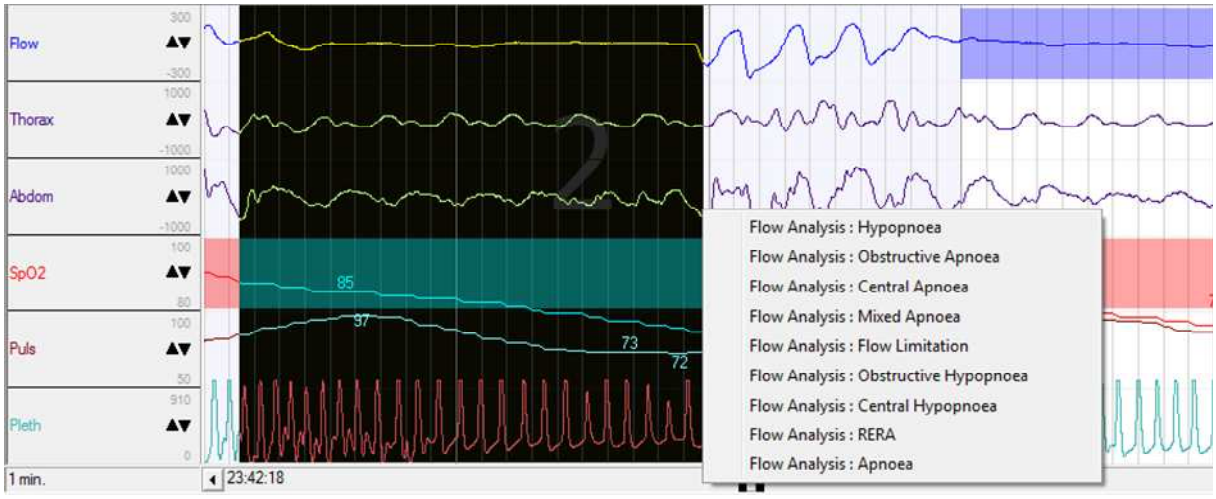
For optimal visualization and differentiation of events of channel arousal classification a colour coding key was added inside the channel name.

A: Arousal
R: Respiratory Arousal
P: PLM Arousal
D: Desaturation Arousal
C: Cardiac Arousal
S: Snore Arousal



10. Selection Edit-Mode for Thorax/Abdomen

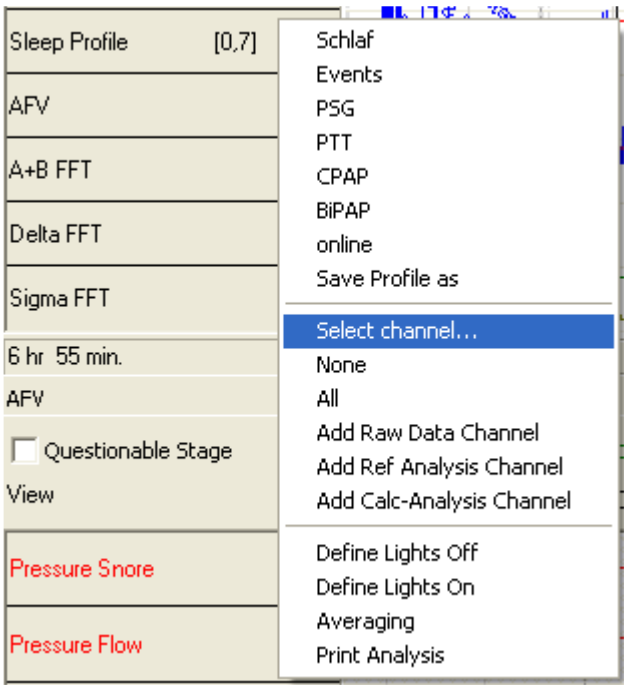
For the use of the selection edit mode both the channels effort thorax and effort abdomen are available for scoring of flow events. Choose the Selection Edit-Mode inside the main menu point “Mode”. After marking the corresponding area inside channel effort thorax or channel effort abdomen a list with possible flow events will be displayed. After selection of one event type from the list, the corresponding flow event will be displayed for the accordant analysis source.



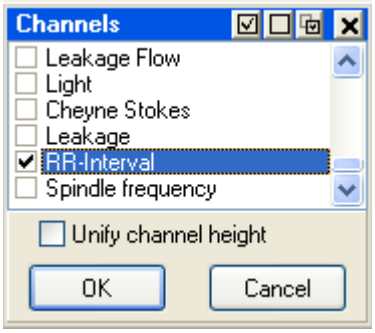
11. New analysis channel RR interval

For detailed investigation of cardiac parameters there is the new analysis channel RR interval, which indicates the time interval between the R waves of two heartbeats.

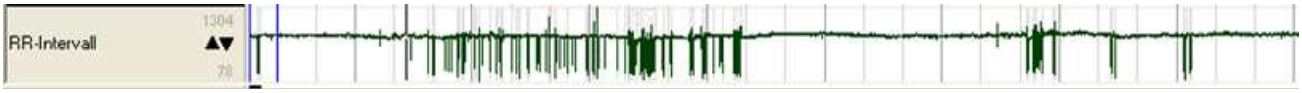
After right click into the analysis frame choose “Select channel…” to open the channel selection menu.



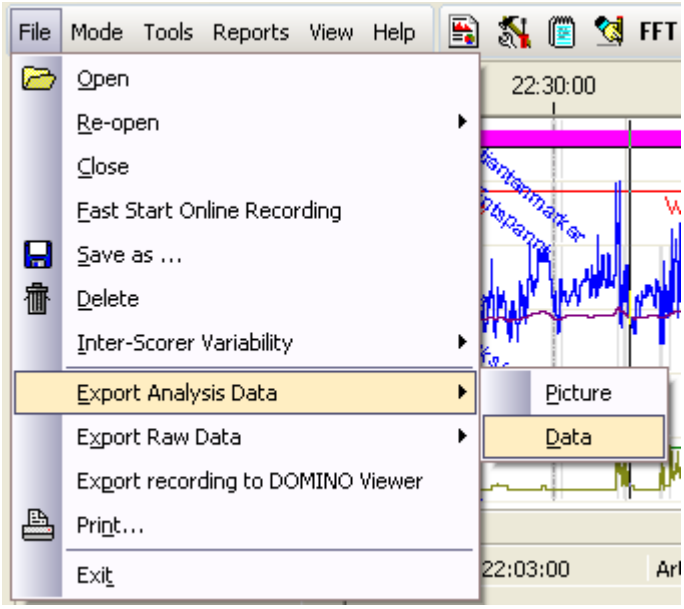
Inside the channel selection choose channel “RR Interval” and confirm your choice with “OK”.



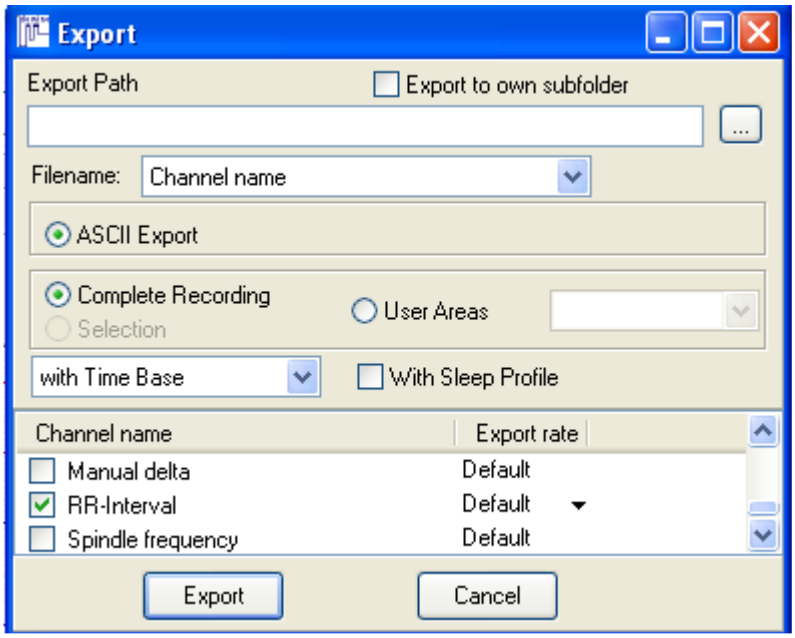
Analysis channel RR Interval will now be displayed inside the analysis frame.



For further analysis the calculated RR intervals are also available for export as text file via ASCII. In order to export the RR interval data, choose main menu point “File” → “”Export Analysis Data” → “Data”.

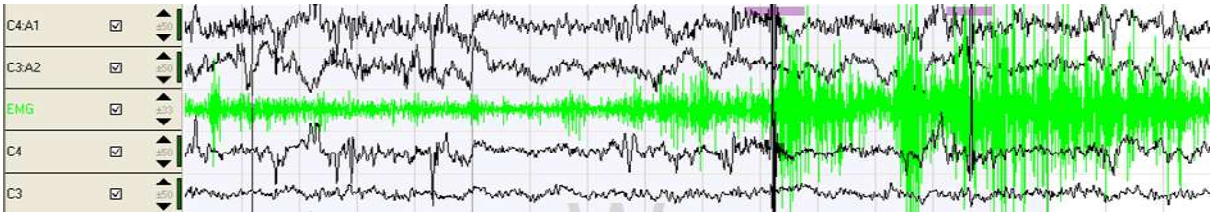


The frame “Export” will open where you can define the export path of the exported data and the desired sampling rate.

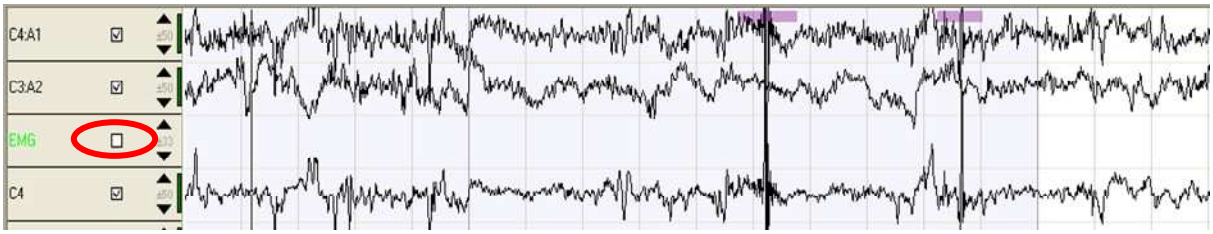


12. Short time masking of EXG channels

During movement artefacts or EMG bursts signals often superpose EEG channels and therefore handicap the analysis of EEG signals at these time points (see picture below).

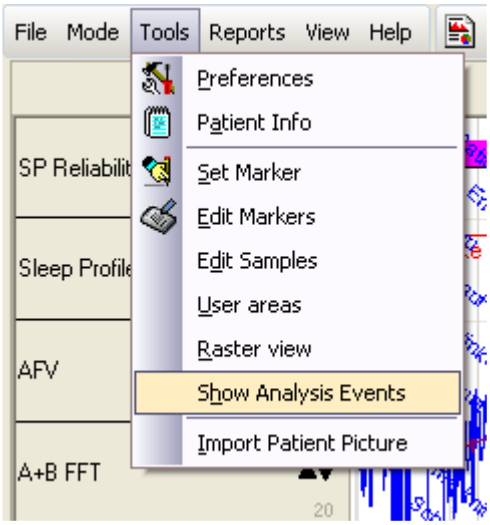


To guarantee a good view of EEG channels over the whole recording time it is possible to temporarily fade out the superposing channels. To do so, inactivate the checkbox (red dot in picture below) inside the channel description. As a result the corresponding signal won't be displayed as long as the checkbox is inactivated.

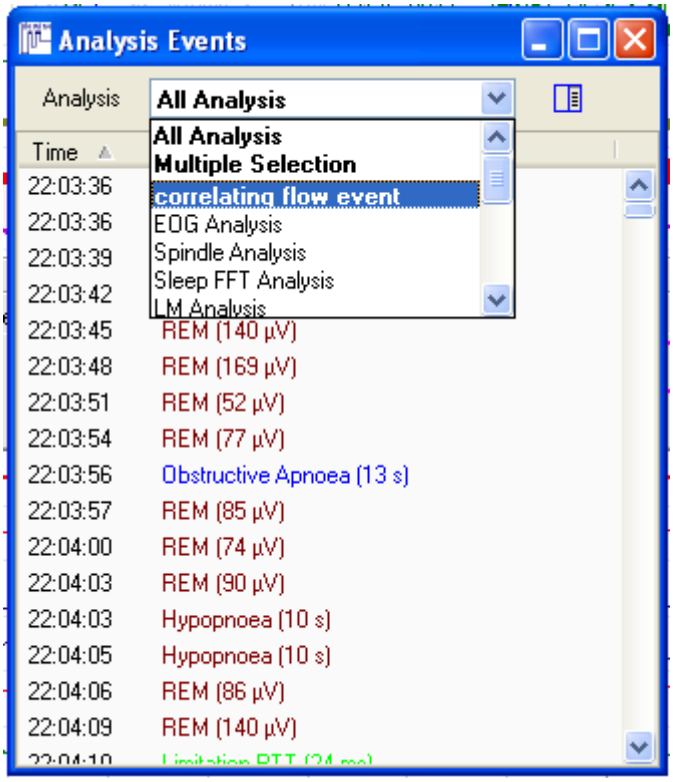


13. Display of correlative blood pressure and flow events

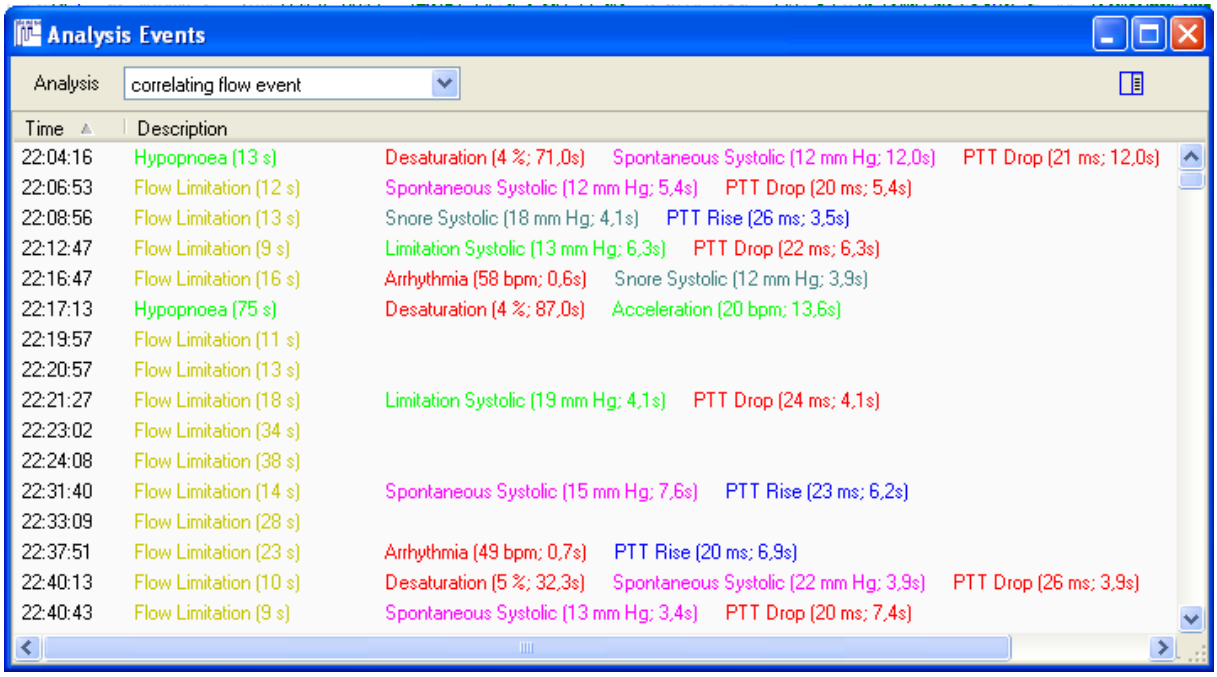
In order to allow the analysis of blood pressure events in regard to respiratory events, correlative blood pressure and flow events can be displayed in an opened recording.
To show correlatingassociated flow and blood pressure events go to "Tools" within the main menu and select "Show Analysis Events".



The window "Analysis Events" opens. Here, select "Correlating Flow Events" in the Drop Down Menu.



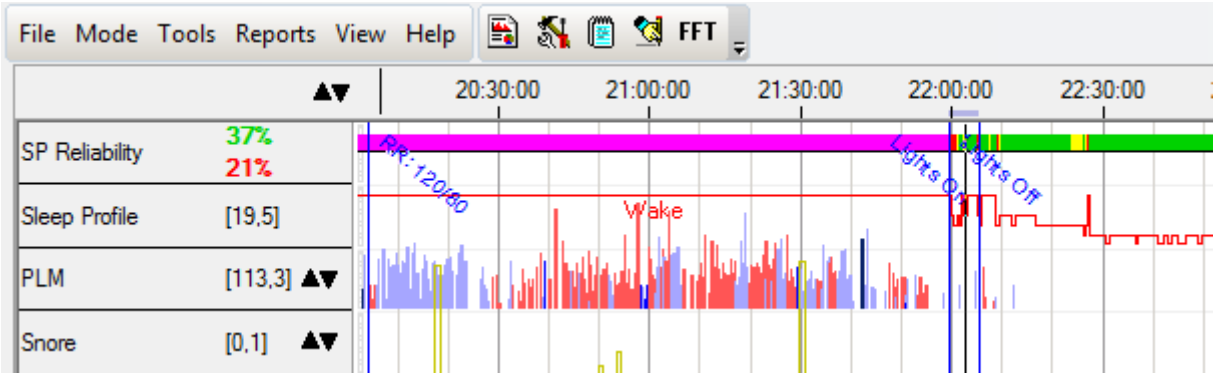
Now, the window “Analysis Events” opens showing all occurring respiratory events together with blood pressure and cardiac events that occur in a time frame of 40 seconds after the respiratory event.


Analysis Events
Analysis
correlating flow event
Time
Description
22:04:16 Hypopnoea (13 s) Desaturation (4 %; 71,0s) Spontaneous Systolic (12 mm Hg; 12,0s) PTT Drop (21 ms; 12,0s)
22:06:53 Flow Limitation (12 s) Spontaneous Systolic (12 mm Hg; 5,4s) PTT Drop (20 ms; 5,4s)
22:08:56 Flow Limitation (13 s) Snore Systolic (18 mm Hg; 4,1s) PTT Rise (26 ms; 3,5s)
22:12:47 Flow Limitation (9 s) Limitation Systolic (13 mm Hg; 6,3s) PTT Drop (22 ms; 6,3s)
22:16:47 Flow Limitation (16 s) Arrhythmia (58 bpm; 0,6s) Snore Systolic (12 mm Hg; 3,9s)
22:17:13 Hypopnoea (75 s) Desaturation (4 %; 87,0s) Acceleration (20 bpm; 13,6s)
22:19:57 Flow Limitation (11 s)
22:20:57 Flow Limitation (13 s)
22:21:27 Flow Limitation (18 s) Limitation Systolic (19 mm Hg; 4,1s) PTT Drop (24 ms; 4,1s)
22:23:02 Flow Limitation (34 s)
22:24:08 Flow Limitation (38 s)
22:31:40 Flow Limitation (14 s) Spontaneous Systolic (15 mm Hg; 7,6s) PTT Rise (23 ms; 6,2s)
22:33:09 Flow Limitation (28 s)
22:37:51 Flow Limitation (23 s) Arrhythmia (49 bpm; 0,7s) PTT Rise (20 ms; 6,9s)
22:40:13 Flow Limitation (10 s) Desaturation (5 %; 32,3s) Spontaneous Systolic (22 mm Hg; 3,9s) PTT Drop (26 ms; 3,9s)
22:40:43 Flow Limitation (9 s) Spontaneous Systolic (13 mm Hg; 3,4s) PTT Drop (20 ms; 7,4s)

By ticking the list icon in the upper right corner of the opened frame “Analysis Events” the event list can be displayed at the very right side of the main window in a discrete way. By clicking single events with the mouse cursor the events will automatically be displayed inside the raw data frame.

14. Display of the sleep profile reliability after manual scoring

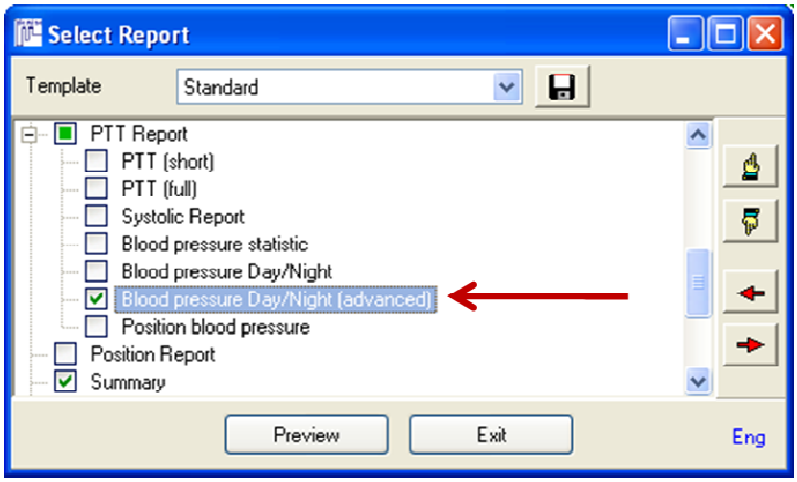
The sleep profile reliability of epochs with a high reliability after automatic analysis is indicated in green. In contrast, the reliability of the sleep profile of manually edited epochs (after manual scoring or use of the advanced sleep editing mode) will be indicated in pink. This allows an improved determination of manually edited epochs in contrast to the automatic analysis by the software.



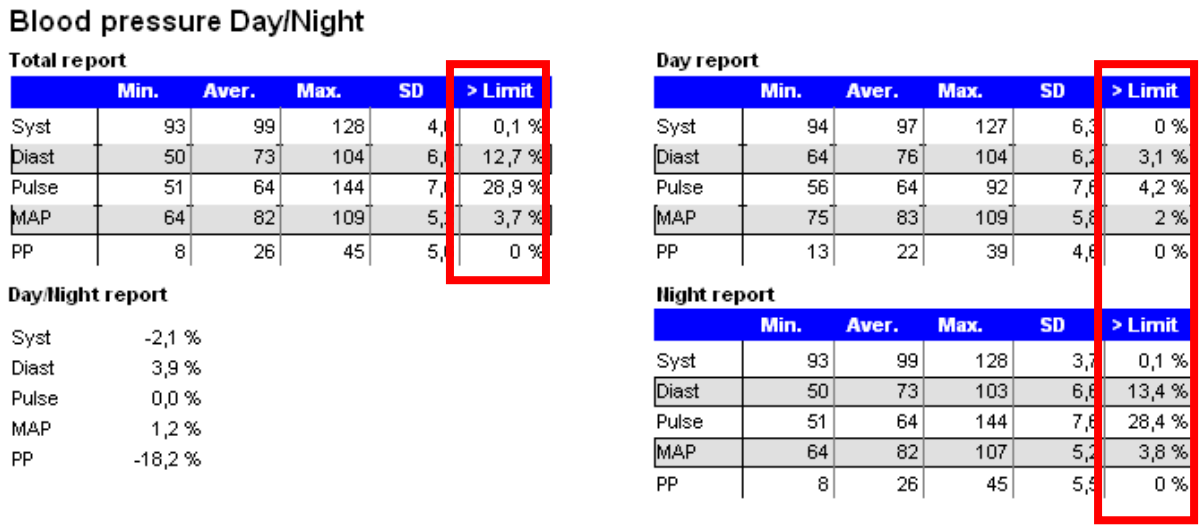
In the same way, the info box surrounding the sleep stage of epochs in the upper menu of the raw data is coloured in pink if the current epoch was manually edited.

15. Advanced Blood Pressure Report

To adjust to reports of conventional 24-hour-blood pressure recording devices, there is the “Blood pressure Day/Night (advanced) report”, which can be chosen for the PTT report inside the report selection window.



Inside this report the percentage of recording time for that the blood pressure, MAP or pulse is exceeding defined values is displayed in column "> Limit" (red boxes in picture below).



Blood pressure Day/Night

Total report

	Min.	Aver.	Max.	SD	> Limit
Syst	93	99	128	4,[illegible]	0,1 %
Diast	50	73	104	6,[illegible]	12,7 %
Pulse	51	64	144	7,[illegible]	28,9 %
MAP	64	82	109	5,[illegible]	3,7 %
PP	8	26	45	5,[illegible]	0 %

Day/Night report

Syst	-2,1 %
Diast	3,9 %
Pulse	0,0 %
MAP	1,2 %
PP	-18,2 %

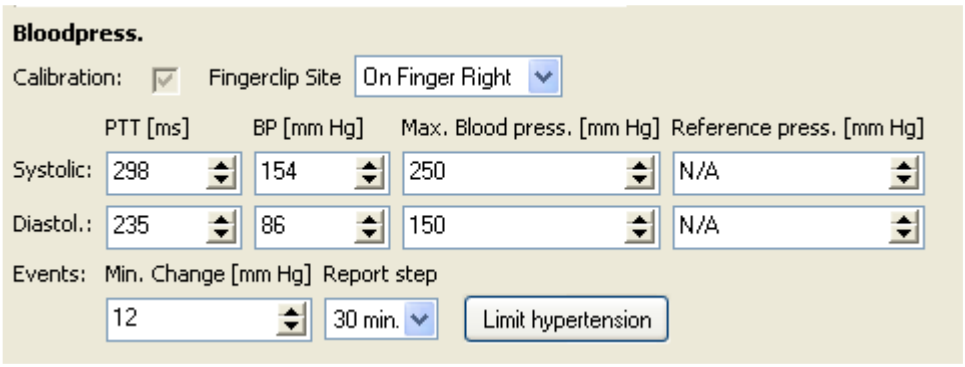
Day report

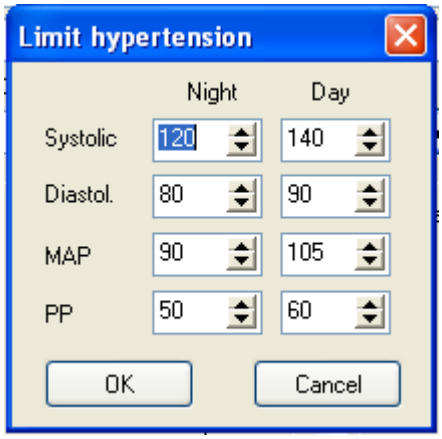
	Min.	Aver.	Max.	SD	> Limit
Syst	94	97	127	6,[illegible]	0 %
Diast	64	76	104	6,[illegible]	3,1 %
Pulse	56	64	92	7,[illegible]	4,2 %
MAP	75	83	109	5,[illegible]	2 %
PP	13	22	39	4,[illegible]	0 %

Night report

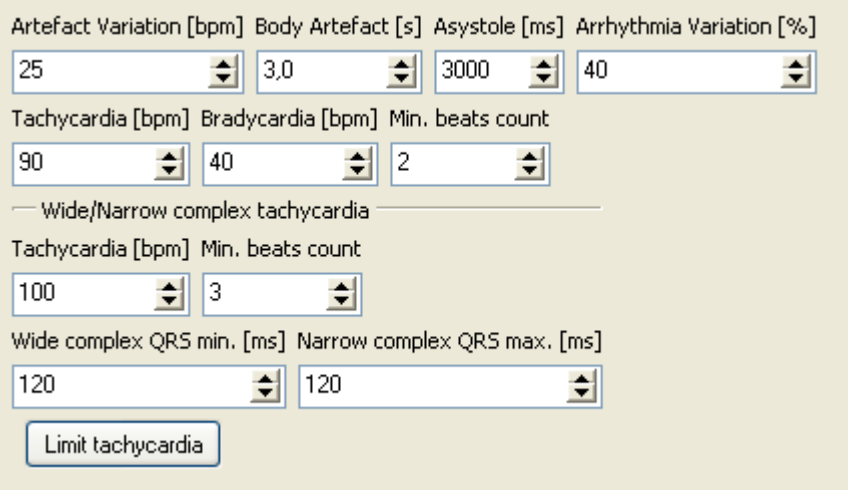
	Min.	Aver.	Max.	SD	> Limit
Syst	93	99	128	3,[illegible]	0,1 %
Diast	50	73	103	6,[illegible]	13,4 %
Pulse	51	64	144	7,[illegible]	28,4 %
MAP	64	82	107	5,[illegible]	3,8 %
PP	8	26	45	5,[illegible]	0 %

In order to make this report part most flexible, the limits for the blood pressure report can be defined be the user. Limits for calculation of systolic, diastolic blood pressure, mean arterial pressure (MAP) and pulse power (PP) can be set inside the settings of the PTT analysis.
Go to tab analyses of the global preferences and select "PTT analysis". Here the button Limit hypertension is available and opens the equally named window, where the limits for the mentioned parameters can be defined.

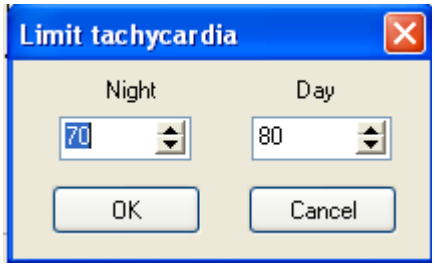




To edit the limits regarding the calculation of the pulse, select “heart rate analysis” or “heart rate AASM analysis” inside tab “analyses” of the global preferences.



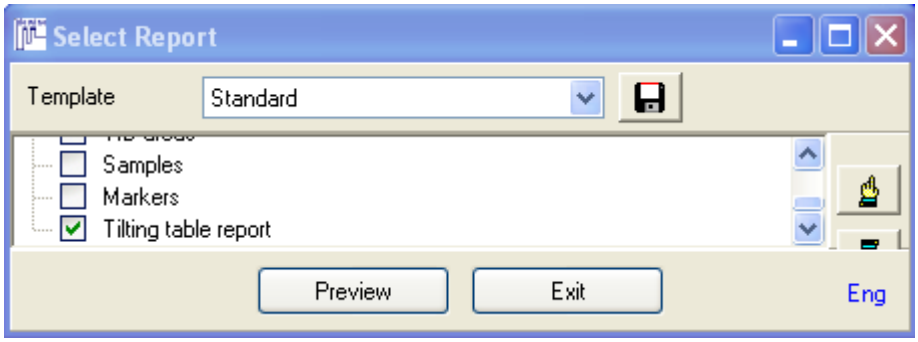
Here, the button Limit Tachycardia is available and opens the window for editing the pulse limits.



To have an overview over the respective limits set by the user, the defined values will be displayed in the footer of the Blood pressure Day/Night (advanced) report.

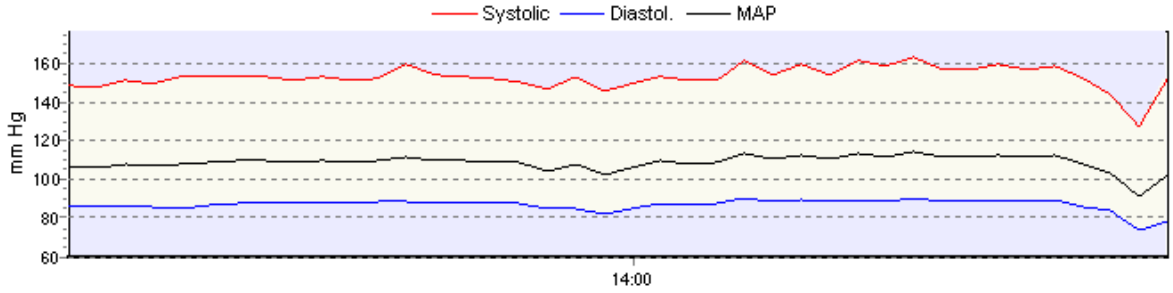
16. Tilting table report

In order to analyse the occurrence of syncopes in regard to dysfunction of the circulatory system, tilting table check ups are performed. To have a complete overview of all important parameters recorded during tilting table check ups, the separated “Tilting table report” can be accessed.
Therefore, the new report part “Tilting table report” can be selected inside the report selection.



If you like to add the tilting table report , tick the corresponding checkbox.
Inside the tilting table report a graphic overview of systolic, diastolic and mean arterial pressure regarding to the recording time is displayed. Additionally the values of blood pressure, pulse and SpO2 are indicated in table format for every one minute interval.

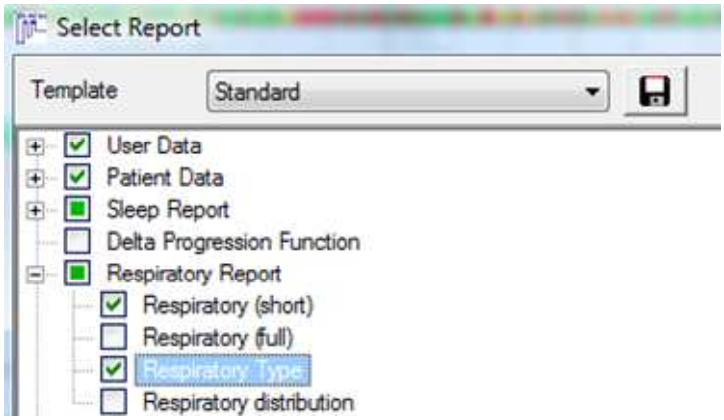
Tilting table report



Time	Blood pressure [mm Hg]	Pulse [bpm]	SpO2 [%]
13:39:58	149 / 86	77	93
13:40:58	148 / 86	73	92
13:41:58	152 / 86	75	92
13:42:58	150 / 86	75	93
13:43:58	154 / 85	71	93
13:44:58	154 / 87	70	92
13:45:58	154 / 88	70	93
13:46:58	154 / 88	70	93

17. Indication of obstructive/central hypopnoeas in the report

It is possible to distinguish between obstructive and central hypopnoeas events during manual scoring. In order to make this information available for the report, too, the respiratory report was extended with report part “Respiratory Type”. This report part can be selected for the respiratory report inside the report selection.

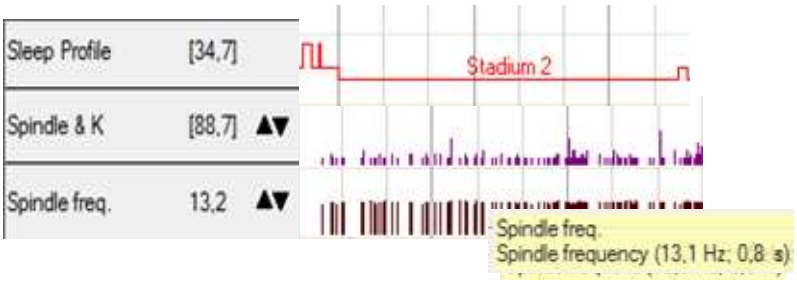


For the report “Respiratory type” the number and index of obstructive, central and undefined hypopnoeas is displayed as well as the number and index of obstructive, central, mixed and undefined apnoeas to give an excellent overview of the different types of occurring respiratory events.

	Obstructive	Central	Mixed	Undefined	sum
Apnoea (Index)	-	-	-	-	-
Hypopnoea (Index)	8 (1,4)	5 (0,8)		2 (0,3)	15 (2,5)
A+H (Index)	8 (1,4)	5 (0,8)	-	2 (0,3)	15 (2,5)

18. New channel “spindle frequency” and new spindle report

As it could be shown, the occurrence of spindles is learning-dependent. To allow the analysis of occurrence of spindles during sleep, a new analysis channel “spindle frequency” and a new spindle report was added.
In analysis channel spindle frequency all automatically and manually scored spindles are displayed. The overall averaged spindle frequency is displayed beside the channel name, while the average frequency and duration of single spindles is displayed inside the yellow info box of the mouse cursor.



Additional to the new analysis channel the spindle report was added. This report part is available inside the report selection.
The spindle report gives a detailed overview of number and index of spindles for the different sleep stages. Additionally, the average number of spindles per epoch is displayed as well as the calculated average spindle frequency.
To complete the report the source used for spindle analysis is indicated in the upper right corner of the spindle report.

Spindle report

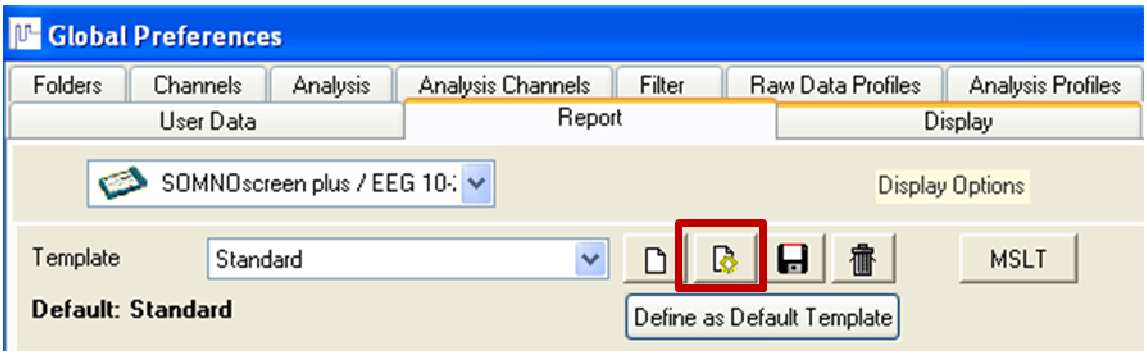
Spindle source: C4:A1

	Wake	Sleep	REM	Stage 1	Stage 2	Deep Sleep	Total
Number (Index)	255 (138,5)	261 (67,9)	12 (75,8)	72 (30,5)	113 (124,4)	64 (153,6)	516 (90,8)
Ø Number/epoch	1,2	1,2	0,6	0,3	1,0	1,3	0,8
Ø Spindle freq. [Hz]	12,99	12,92	12,79	12,95	12,90	12,93	12,96

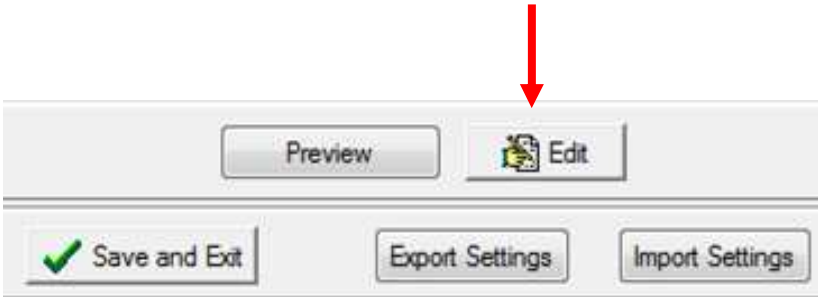
19. New Features for the Custom Report

19.1. Creating tables

The function “Add table” provides the possibility to display analysis results in an custom form inside the report. Tables can only be generated inside the custom report. For this, open the tab “Report” within the global preferences and click the button “New Custom Template”.

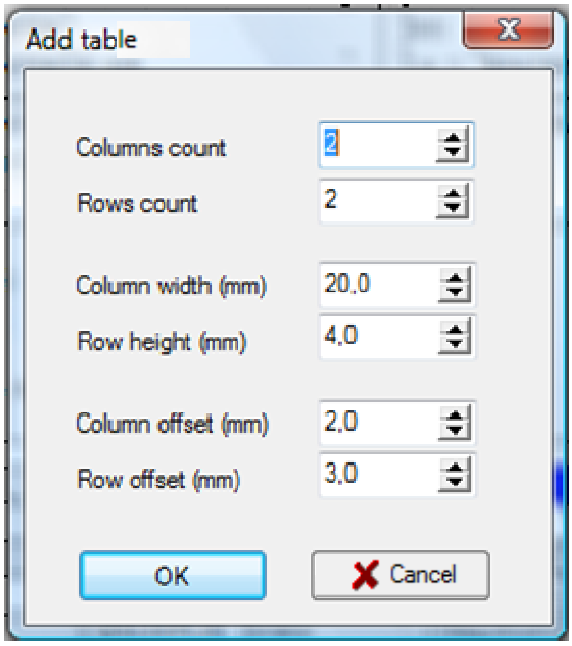


After defining a name for the new custom template, generate or edit the new custom report using the “Edit” button, which is available in the lower menu bar.



The window “Create Custom Report” will appear.

Click icon “Add table” and the window “Add table” will be opened in which the desired number, width and height of columns and rows can be defined as well as the offset between columns and rows.



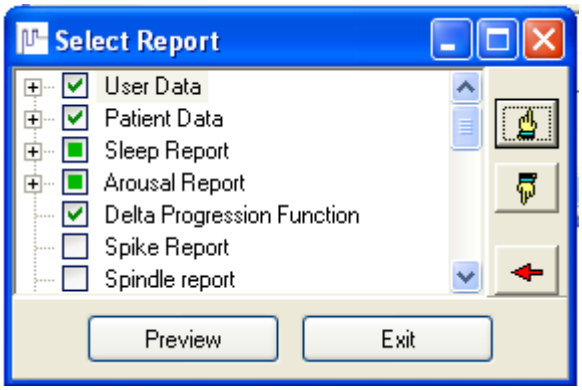
After confirming with “OK”, define the position of the table inside the report via a click with your mouse.

19.2. Editing of text fields

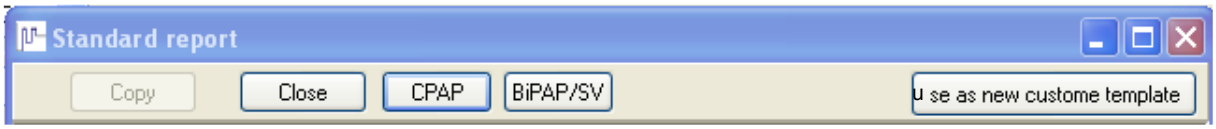
In order to write into text fields, the corresponding text field has to be activated by ticking it with the mouse cursor. As soon as the text field is activated the text can be edited.
To provide a user-friendly way of editing text fields inside the custom report, options for mark ups of text fields are available inside the menu bar. Here, the font can be edited as well as the justification of the text field and the mark up options “bold”, “italic” or “underline” are available.

19.3. Taking parts of the standard report as custom report

For the case that only few points of the standard report should be added or edited, it is possible to transfer the whole standard report to a custom report template. For that tick icon “Standard report” inside the window “Create custom report” and select the desired report parts that should be use as custom report.

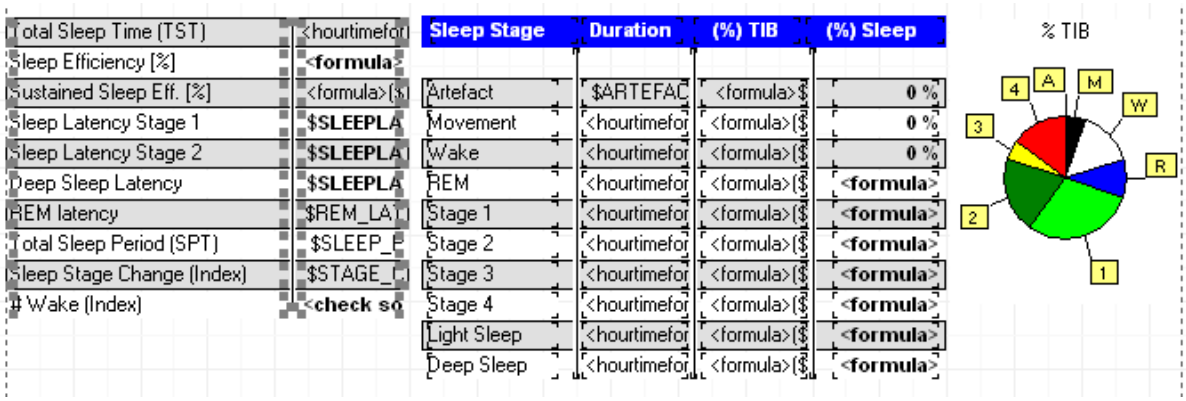


After opening the preview of the selected report parts, click button “Use as new custom template” that is present in the upper menu bar of the window, to transfer the selected report to a custom template.



After transfer of the standard report, the generated custom template can be individually modified and edited.

Additionally to the transfer of the whole standard report, individual parts of the standard report can be selected for the custom template. For this mark the desired report parts inside the preview of the standard report using your mouse cursor. Marked fields will be indicated by grey squares.

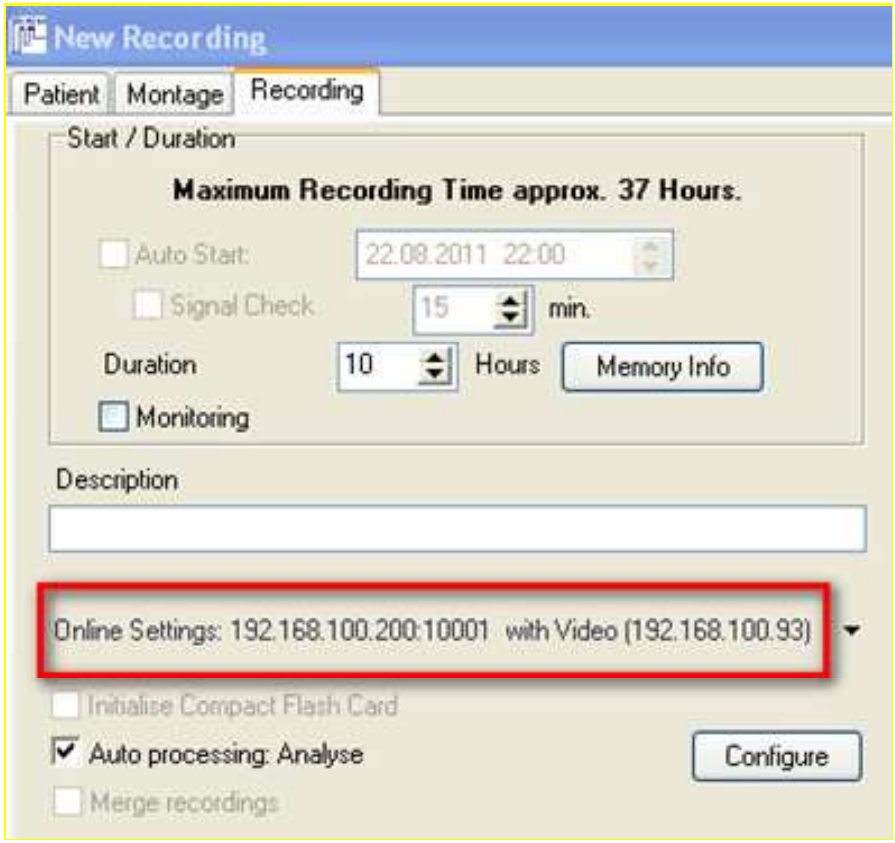


The marked parts can then be moved to the custom template either by using the copy and paste function after right click or simply via drag’n drop.

20. Online Recording

20.1. Display of the camera IP

For a quick overview of set IP addresses, the camera IP will be displayed beside the SOMNOscreen device. This provides best control of set IP addresses while starting an online recording and prevents the use of invalid IPs.



20.2. Editing analysis parameters during online recording

In order to correct analysis settings without the need of cancelling and restarting the running recording, the preferences are available during online recording and can also be edited. E.g. this allows editing parameters of the PTT analysis and avoids marking of artefact areas due to poor blood circulation of the patient. For editing of analysis parameters choose “Tools” inside the main menu and then tab “Analysis”. After selection of the desired analysis and editing of the analysis parameters confirm with “OK” to use the new settings for online analysis.

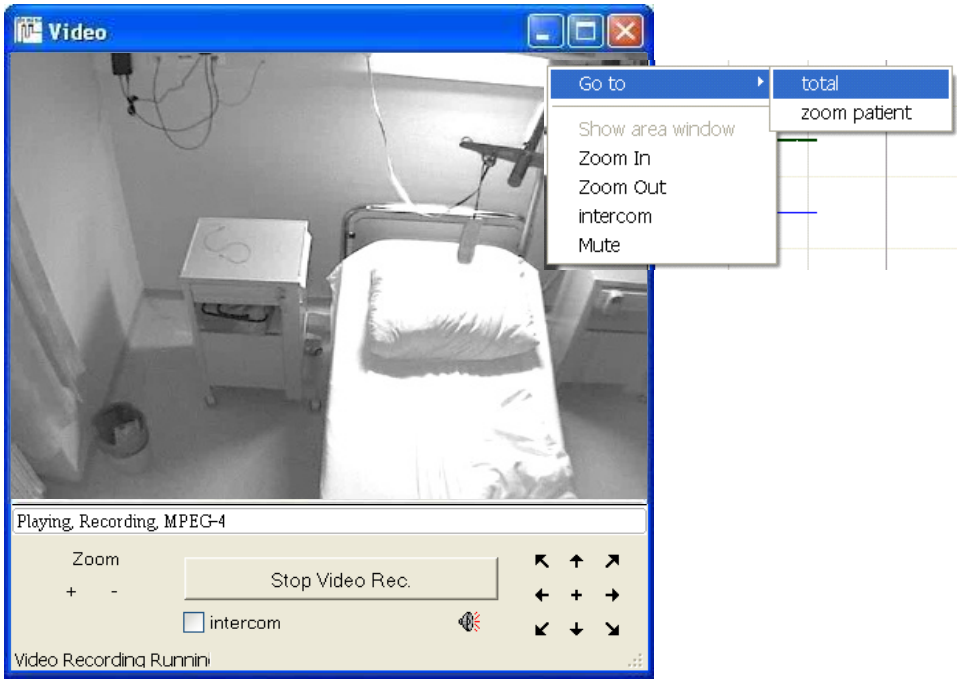
21. Defining camera positions for the High End camera

For the use of the High End camera with optical zoom, different camera positions can be created inside the camera set up of the AXIS Module.
Open the AXIS module and open the setup menu by ticking button “Setup” in the upper menu bar.

Next, choose “PTZ Configuration” in the left menu column.

Here, you can define (1) different camera positions and add (2) these positions to the list of available camera positions (3).

These defined positions are now available during online recording and can be selected from the pop up menu after right click into the video window.



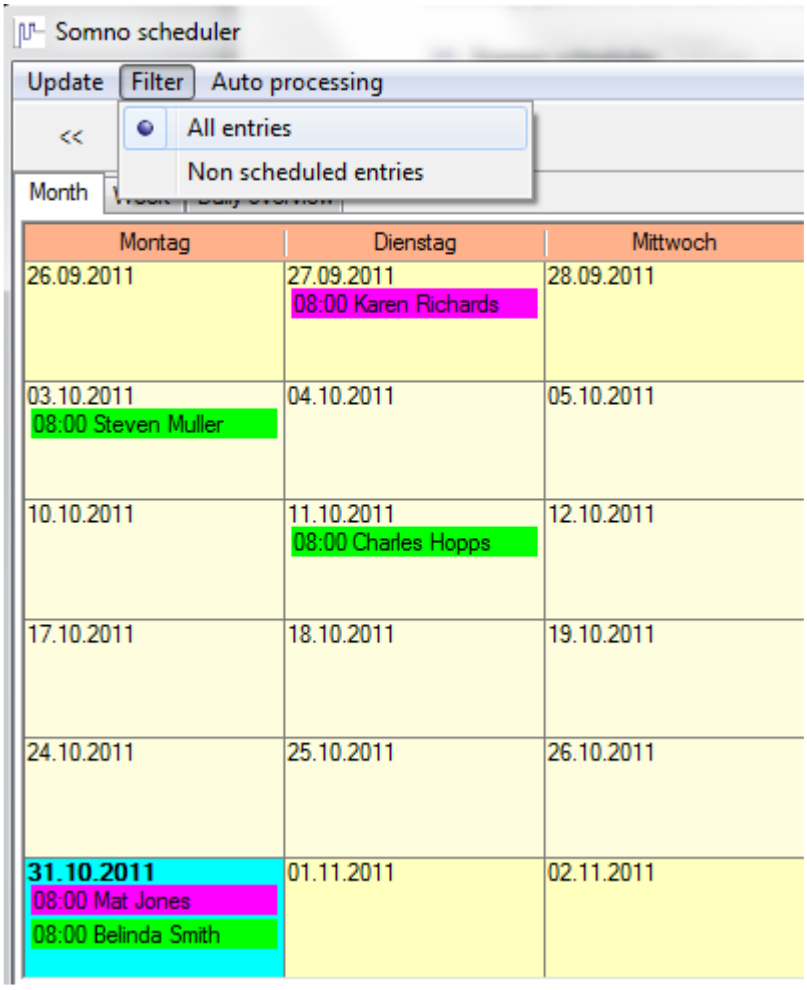
22. Defining video areas for the HD camera

During the use of the HD camera with best digital zoom, it is possible to display different areas in a second video stream during recording or video replay. This allows a precise monitoring of the patient during PSG. To open the second stream tick button “Area” inside the video frame. Here, in the camera’s setup pre-defined areas can be selected inside the scroll down menu and can be displayed in a second video stream.

23. Advanced Scheduler

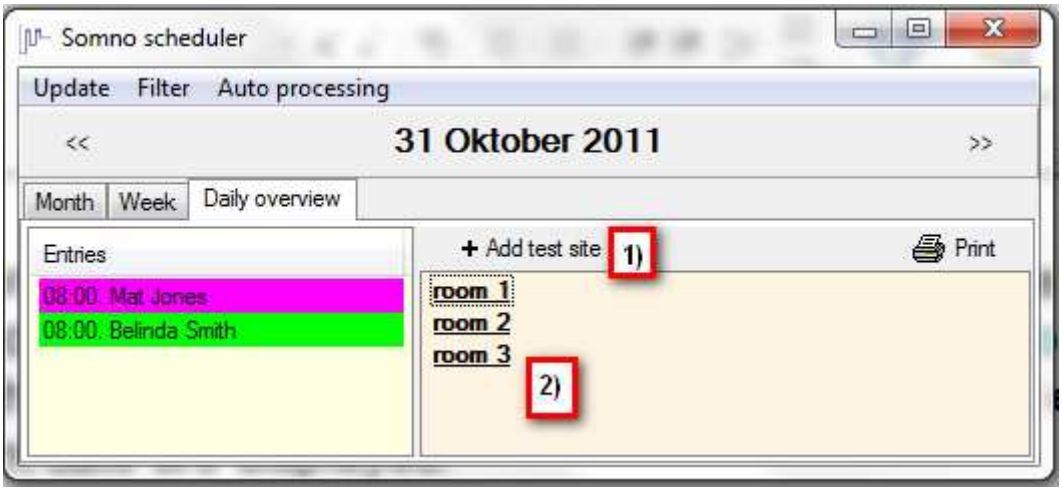
23.1. Differentiation between scheduled and non-scheduled patients

For sleep labs with a high number of daily patients for PSG check-ups, the scheduler was extended with the function “Filter”, which provides a possibility to distinguish between patients with an arranged check-up date and patients who have no arranged date so far. Ticking Button “Filter” opens the short menu where you can choose function “All entries” to get an overview of already scheduled patients (displayed in pink) and non-scheduled patients (displayed in green) together. To distinguish between scheduled and non-scheduled patients, function “Non scheduled entries” can be ticked with the result that only patients without an arranged check-up date will be displayed.

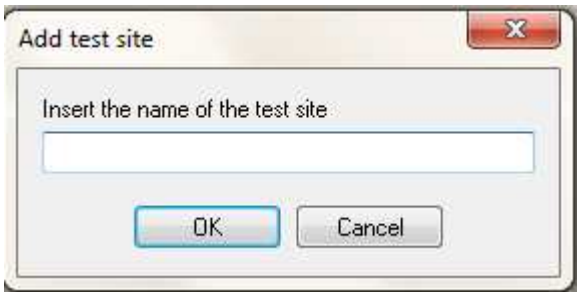


23.2. Daily overview

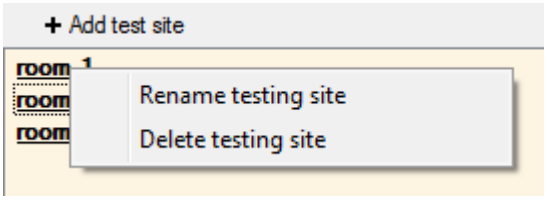
To provide an optimal overview of patients planned for the current day, the scheduler provides tab “Daily overview”. All entries for the current day are displayed in the left part of tab “daily overview”. At the right part of tab “daily overview” the available test sites are present. In order to create and add test sites tick Button Add test site (1).



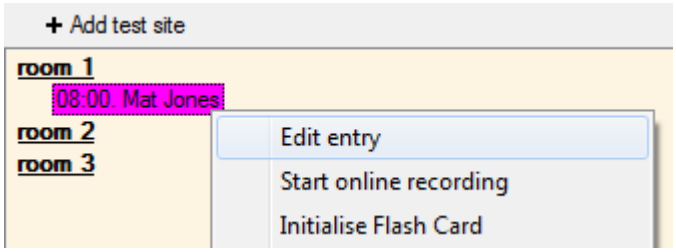
Another window will open where you can define the name of the different test sites (for example room 1). After confirming with “OK” the created test site will be present inside the daily overview (2).



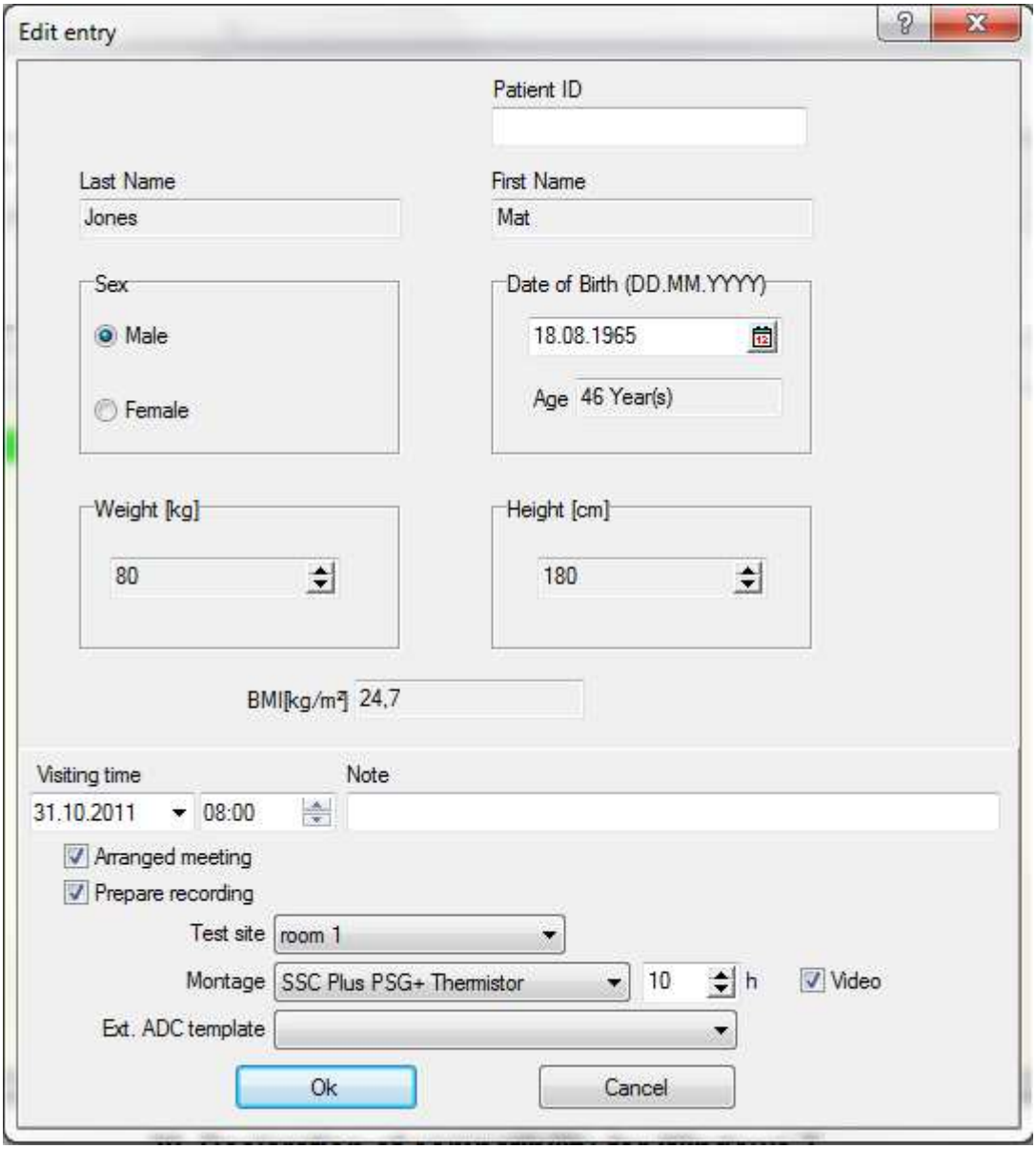
Already existing test sites can be deleted or renamed by doing a right click onto the corresponding test site.



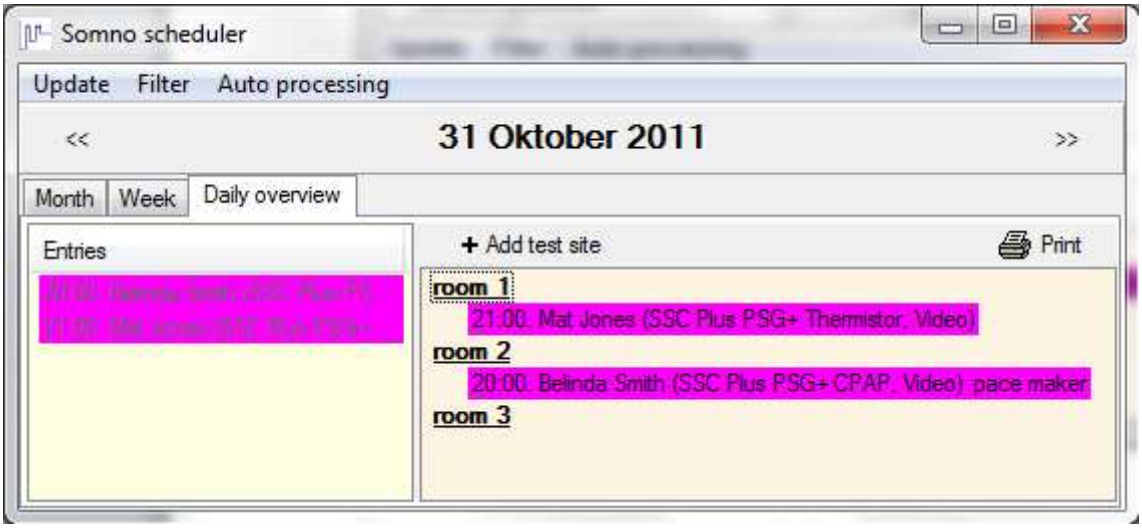
In order to assign patients to a test site the patient’s entry can be moved to the desired test site using Drag’n Drop. In order do edit and prepare entries for recording do a right click on the corresponding entry to open the entry menue and choose „edit entry“.



Now the frame “Edit entry” opens providing an overview of the pateint’s data in the upper half of the window and the oppurtunity to prepare the PSG recording in the lower window part.

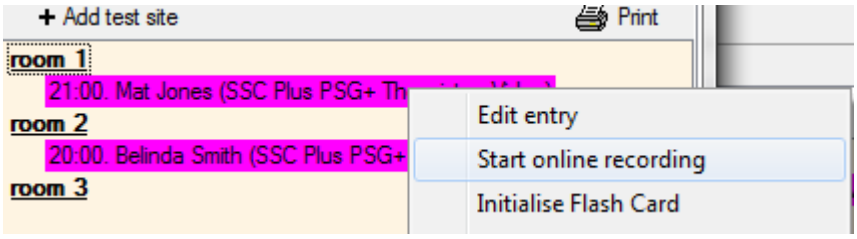


Here, you can insert or edit the data for the visiting time, choose the test site and select a desired montage from the Drop Down menu. Additionally you can define the recording time and if video recording is planned. In the case that external channels are recorded using the ADC Board, predefined ADC templates can be selected from the drop down menu. If there are important factors to which attention should be paid (e.g. patient is having a pace maker), there is the opportunity to write a note. After completion of editing the entry, all the filled data are available inside the daily overview.



To provide a detailed overview of all patients with prepared recordings for the current day, all the relevant data like test site, patient name, arranged time, montage, ADC template, Video recording and note can be printed in a list using the button “Print” in the upper right corner of the Daily overview.

Finally, all prepared recordings can be directly started from the scheduler’s entry menu by a right click on the corresponding entry and ticking “Start online recording”. The recording will then start with the selected montage using the last set video and device IP according to the test site.



24. Declaration of compatibility for Windows 7

Functionality of DOMINO software version 2.5.0 was tested and verified for operation system Windows XP and Windows 7 Professional (64 Bit).

We hope you enjoy using these new features and welcome your comments.